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PATENT

Customer No. 22,852

Attorney Docket No. 08350.1649-02

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of:)
)
James WEBER et al.) Group Art Unit: 3747
)
Application No.: 10/733,570) Examiner: Mahmoud Gimie
)
Filed: December 12, 2003) Confirmation No. 1629
)
For: AIR AND FUEL SUPPLY SYSTEM)
FOR COMBUSTION ENGINE)

Commissioner for Patents
P. O. Box 1450
Alexandria, VA 22313-1450

Sir:

INFORMATION DISCLOSURE STATEMENT UNDER 37 C.F.R. § 1.97(c)

Pursuant to 37 C.F.R. §§ 1.56 and 1.97(c), Applicants bring to the attention of the Examiner the following information and the documents identified on the attached form PTO/SB/08. Although a number of the listed documents were cited previously in this application, the Applicants have listed them again on the accompanying Form PTO/SB/08 along with brief identifications of particular portions that the Examiner might possibly find to be germane to one or more issues related to this application. In addition, to facilitate the Examiner's consideration of certain references, Applicants provide the following remarks regarding particular cited references.

03/23/2006 HALI11 00000116 10733570

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U.S. Patent No. 3,257,797 to Lieberherr ("Lieberherr")

The following drawings are Figs. 1 and 7 of Lieberherr including annotations highlighting certain features.

FIGURE 1 OF LIEBERHERR ANNOTATED

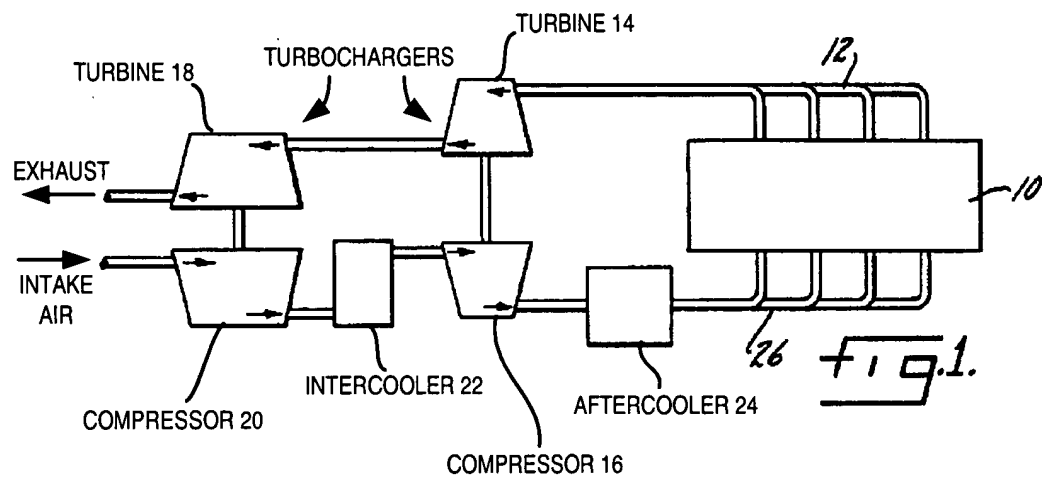
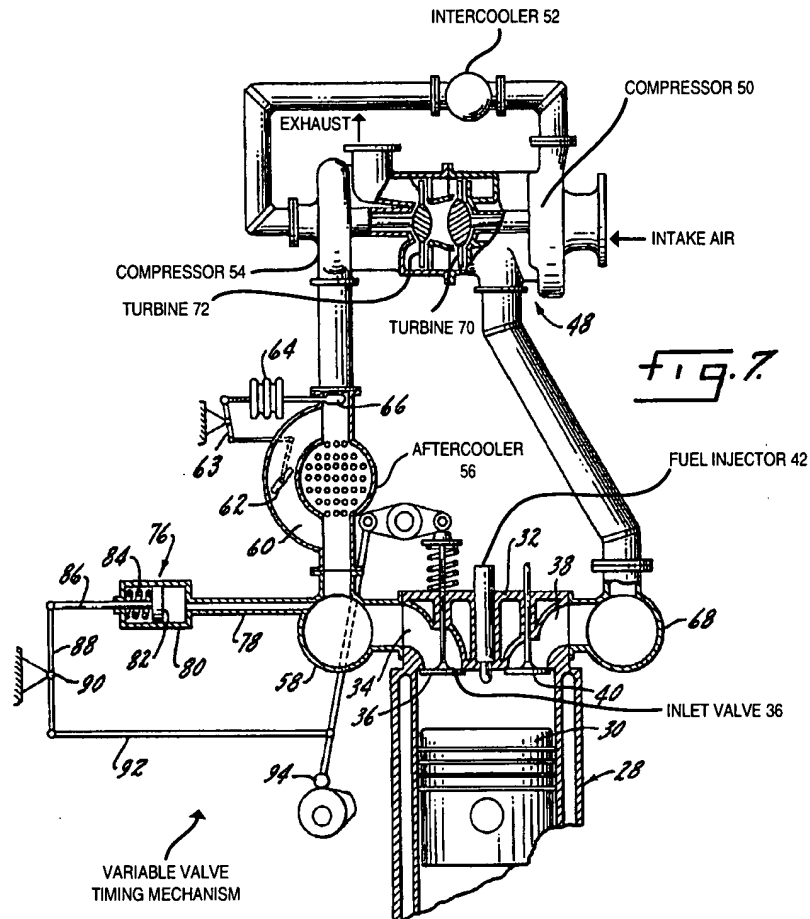


FIGURE 7 OF LIEBERHERR ANNOTATED



Lieberherr discloses a four cycle, compression-ignition (diesel) engine including the following combination of features:

- closing an intake valve 36 late during the compression stroke (or early during the intake stroke) (col. 6, lines 57-63);

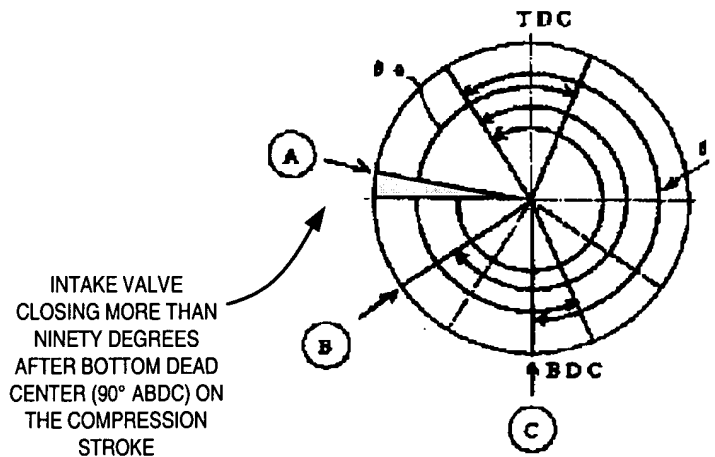
- variable valve timing varying the opening and closing time of the intake valve 36, resulting in a variable compression ratio (col. 6, lines 57-63; col. 10, lines 17-24; col. 14, lines 13-15 and 23-24);
- 2-stage turbocharging including exhaust-gas driven compressors 20, 50 and 16, 54 compressing intake air (Figs. 1 and 7; col. 3, lines 1-9; col. 9, lines 53-71; col. 13, line 66 - col. 14, line 5);
- Cooling compressed intake air via an intercooler 22, 52 and aftercooler 24, 56 (Figs. 1 and 7; col. 3, lines 1-9; col. 9, lines 53-71; col. 13, line 66 - col. 14, line 5)
- intake air pre-compressed to 4 atmospheres and cooled to 85° C (Fig. 4; col. 7, lines 20-54); and
- diesel fuel injector 42 (Fig. 7; col. 9, lines 48-49) (Note: Obert, Internal Combustion Engines, *Analysis and Practice*, Second ed., 1950, pg. 143, Fig. 5-12 ("Obert") discloses that diesel, compression-ignition involves injecting fuel after an intake valve closes, during the compression stroke and during the expansion stroke).

JP - 07-091265 ("JP '265")

JP '265 discloses a diesel engine (translation at page 9, paragraph 15). Included in the documents submitted herewith is a further translation of JP '265 including correction of a number of inadvertent translation mistakes in the translation provided in the previous Information Disclosure Statement filed January 20, 2006. JP '265 discloses the following:

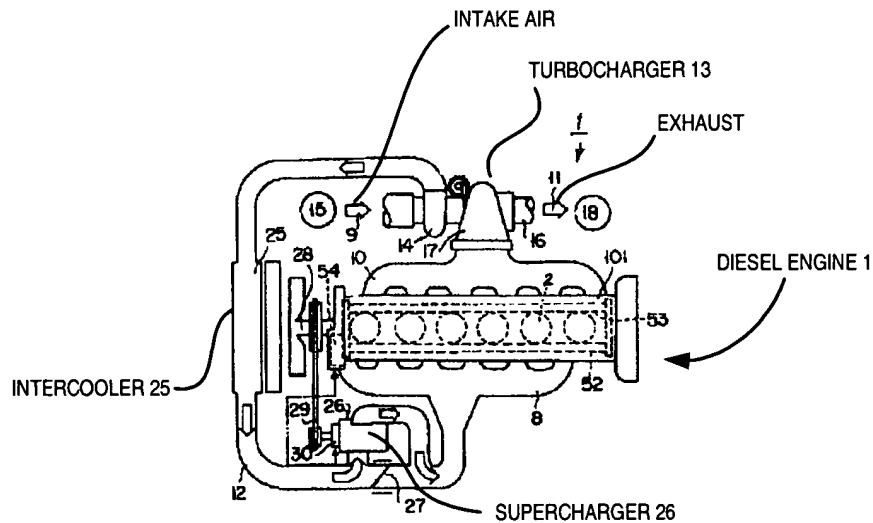
- Ultra Late Closing of an Intake Valve During the Compression Stroke: As shown in the following annotated Fig. 14 of JP '265, JP '265 discloses an intake valve being open during the intake stroke and remaining open during a majority of the compression stroke, until the intake valve is closed after a piston is more than 90 crank angle degrees from bottom dead center of its compression stroke (up to 120° after bottom dead center of the compression stroke) (translation pages 11-12, paragraph 20).

FIGURE 14 OF JP 07-091265 ANNOTATED



- As shown in the following Fig. 1 of JP '265 including annotations, JP '265 discloses 2-stage intake air pre-compression involving a turbocharger 13, supercharger 26, and intercooler 25; (translation at pages 9-10, paragraph 15).

FIGURE 1 OF JP 07-091265 ANNOTATED



- Direct injection of diesel fuel (translation page 9, paragraph 15; and page 13, paragraph 24). (As noted above, Obert discloses that diesel fuel injection involves injecting fuel after an intake valve closes, during the compression stroke and during the expansion stroke.) The following Fig. 21 of JP '265 includes annotations showing how JP '265 discloses a fuel injector.

FIGURE 21 OF JP 07-091265 ANNOTATED

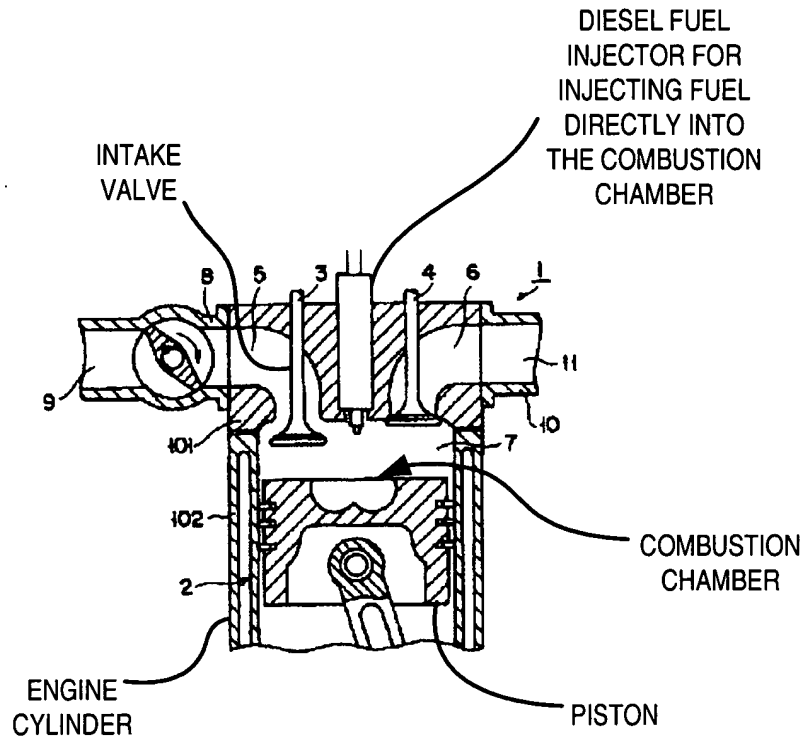


FIG. 21

Zappa, et al., CIMAC, "A 4-Stroke High Speed Diesel Engine . . ." ("Zappa, et al.")

Zappa et al. is discussed, in detail, in the Request for *Ex Parte* Reexamination filed on January 20, 2006, for U.S. Patent No. 6,680,280. As discussed in more detail in that request, Zappa et al. discloses the following features:

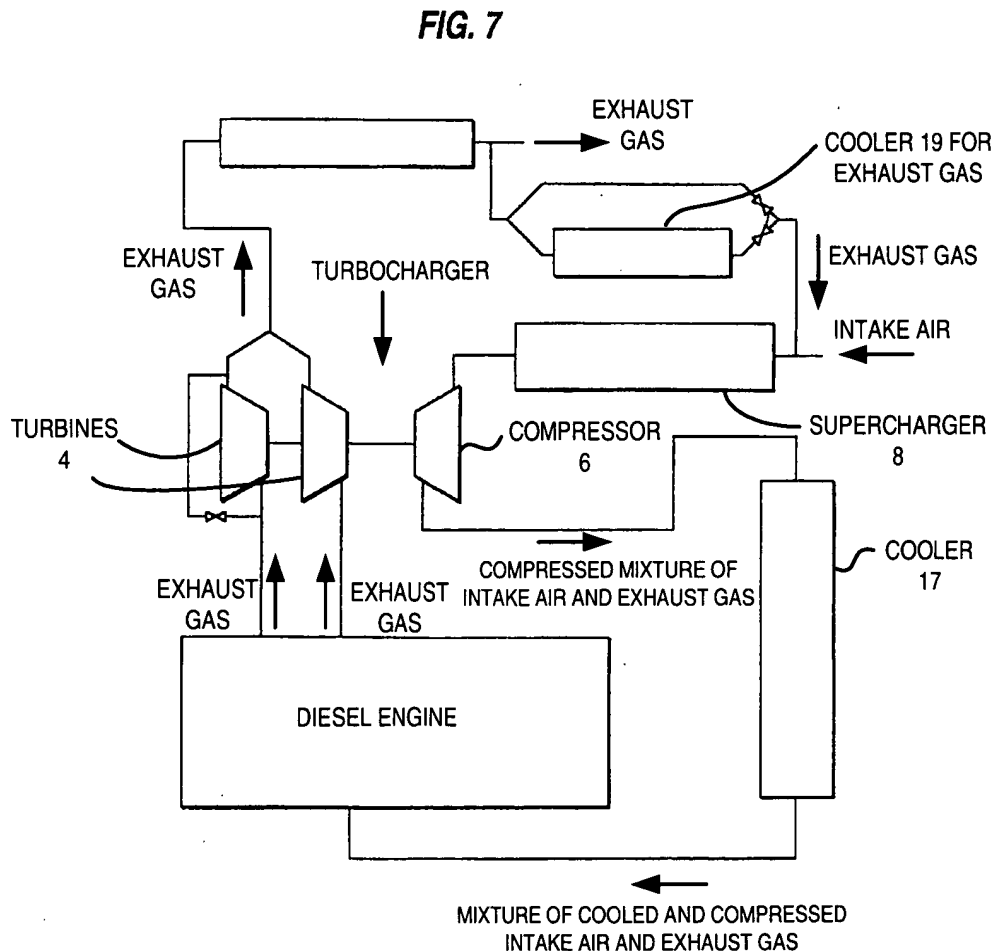
- a pair of turbochargers in series;
- a first intake intercooler between the turbochargers;
- a second intake intercooler downstream of the turbochargers;
- an inlet valve control device varying the closing timing of the intake valve(s);

- closing the intake valve(s) after a majority portion of the compression stroke;
and
- injecting fuel into the combustion chamber after closing of the intake valve(s)
and during the compression and expansion strokes.

U.S. Patent No. 5,617,726 to Sheridan, et al. ("Sheridan et al.")

The following drawing is Fig. 7 of Sheridan et al. including annotations highlighting certain features.

FIGURE 7 OF SHERIDAN, ET AL. ANNOTATED



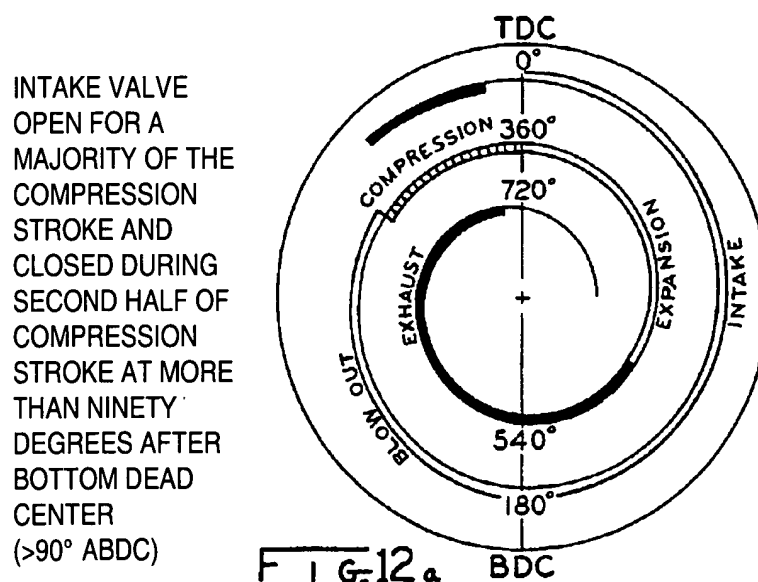
Sheridan et al. discloses a diesel engine (col. 5, lines 12-15) including:

- Exhaust gas recirculation involving exhaust gas being mixed with intake air prior to passing the air and recirculated exhaust gas mixture through multiple stages of pre-compression and cooling;
- 2-stages of pre-compression including a supercharger 8 and turbocharger compressor 6;
- Recirculated exhaust gas being cooled via a cooler 19 prior to mixing the recirculated exhaust gas with intake air; and
- Cooling the compressed air and recirculated exhaust gas mixture via a cooler 17.

U.S. Patent No. 4,878,464 to Richeson, Jr., et al. ("Richeson, Jr., et al.")

The following drawing is Fig. 12a of Richeson, Jr., et al. including annotations highlighting disclosed features.

FIGURE 12A OF RICHESON, JR. ET AL. ANNOTATED



As illustrated in annotated Fig. 12a above, Richeson, Jr., et al. discloses an intake valve being open during the intake stroke and remaining open during a majority portion of the compression stroke, until the intake valve is closed after a piston is more than 90 crank angle degrees from bottom dead center of its compression stroke. See col. 11, line 26 - col. 12, line 7 referring to the valve operation of Fig. 12a as being a "mode 2" having the advantage of not requiring as much energy for intake valve operation, as well as providing finer control of the intake charge.

U.S. Patent No. 4,798,184 to Palko ("Palko")

Palko discloses the following:

- 4-stroke extended expansion diesel engine (col. 2, lines 47-48);
- compression ratio less than half expansion ratio with compression ratio to expansion ratio (C/E) up to 1:3 (col. 3, lines 3-7; col. 6, lines 45-50);
- an intake valve being open during a majority portion of the compression stroke and closed in the second half of compression stroke (e.g., in Fig. 2, the location 21 of intake valve closure is closer to piston top dead center (TDC) of the compression stroke than bottom dead center (BDC) of the compression stroke (col. 3, lines 7-15; and col. 5, line 67 - col. 6, line 10); and
- fuel injection into the combustion chamber substantially at the end of the compression stroke and being sustained until approximately 30 crank angle degrees into the expansion stroke (col. 3, lines 43-51).

U.S. Patent No. 4,930,315 to Kanesaka ("Kanesaka")

Kanesaka discloses the following:

- multiple stages of pre-compression of intake air including at least three stages (Fig. 7); and
- compression ratio decreased with shortened intake stroke and extended expansion stroke (col. 6, lines 37-43; Fig. 16; col. 9, line 63 - col. 10, line 9).

U.S. Patent No. 2,670,595 to Miller ("Miller '595")

Miller '595 discloses the following:

- a direct-injection, diesel engine (col. 2, lines 13-15; Fig. 1; Fig. 6);
- air pre-compressed and cooled (Fig. 1 (compressor 19, cooler 20); Fig. 6 and col. 9, lines 8-22 (compressor 55, intercooler 58)); and
- intake valve closed early in the intake stroke or late in the compression stroke (col. 8, lines 14-23) and closed as early as about 60° after top dead center on the intake stroke (col. 6, lines 67-70).

Thring, SAE 900175, "The Flexible Diesel Engine" ("Thring")

Thring discloses the following features:

- a four-stroke cycle direct injection diesel engine (page 31, col. 2, second paragraph, line 10);
- turbocharging with intercooling (page 31, col. 2, second paragraph, lines 9-11);
- variable compression ratio and variable valve timing (page 31, col. 1, second paragraph, lines 1-4; page 36, col. 1, first paragraph under the heading "Variable Compression Ratio" and col. 2, last paragraph, lines 1-2); and

- intake valve closing at 683 degrees (page 31, col. 2, Table 1, "Valve Timing: . . . IVC 683") which in the 720 degree four-stroke cycle corresponds to 143 degrees after bottom dead center on the compression stroke, indicating that the intake valve is open for a majority portion of the compression stroke and closed in the second half of the compression stroke.

U.S. Patent No. 4,805,571 to Humphrey ("Humphrey")

Humphrey discloses an engine including the following features:

- pumping air into the combustion chamber (col. 2, lines 54-56);
- compression and glow-plug ignition engine (col. 6, line 50); and
- an intake valve open during a majority portion of the compression stroke and closed in the second half of the compression stroke (col. 14, lines 50-52 (referring to intake valve closing "very late and well into the compression stroke"); col. 21, lines 5-8 (referring to intake valve closing at "135° into the compression stroke"); col. 24, lines 30-40 (referring to intake valve closing at 52° before the end of the compression stroke with a compression ratio as low as 2:1)).

U.S. Patent No. 2,344,993 to Lysholm ("Lysholm")

Lysholm discloses the following:

- intake air pre-compressed and cooled (Fig. 4 and page 4, col. 1, lines 31-40 (supercharger 26, intercooler 32); Fig. 9 and page 4, col. 2, lines 32-37 (supercharger 72, intercooler 82));
- an intake valve is open during a majority portion of the compression stroke and closed in the second half of the compression stroke (Fig. 8); and

- direct injection of fuel “late in the compression stroke or even after the end of the compression stroke” (Fig. 9; page 4, col. 2, lines 62-71).

U.S. Patent No. 3,015,934 to Miller (“Miller ‘934”)

Miller ‘934 discloses the following:

- air pre-compressed and cooled (Fig. 1 and col. 1, lines 48-60 (compressor 30, intercooler 36));
- the intake valve is open during a majority portion of the compression stroke and closed in the second half of the compression stroke (col. 2, lines 31-35 (referring to the intake valve closing “60 or 70 degrees before top dead center”)); and
- the intake valve may be closed very early in the intake stroke (Fig. 4) or very late in compression stroke (Fig. 5).

U.S. Patent No. 5,429,100 to Goto, et al. (“Goto et al. ‘100”)

Goto, et al. ‘100 discloses:

- air pre-compression with cooling (Fig. 1 and col. 3, line 61 to col. 4, line 11 (supercharger 10, intercooler 16)); and
- intake valve may be open during a majority portion of the compression stroke and closed in the second half of compression stroke (Fig. 4, Fig. 5, Fig. 10, column 2, lines 15-18, and column 4, lines 23-27 (up to 100° after bottom dead center (ABDC))).

U.S. Patent No. 5,549,095 to Goto, et al. ("Goto, et al. '095")

Goto, et al. '095 discloses:

- air pre-compression with cooling (Fig. 1 and col. 4, lines 42-44 (supercharger 20, intercooler 22)); and
- Miller cycle with closing of intake valve retarded greatly after bottom dead center (col. 1, lines 15-18). The intake valve is open during a majority portion of the compression stroke and closed in the second half of the compression stroke (col. 5, lines 24-27 (up to 100° after bottom dead center (ABDC))).

U.S. Patent No. 5,357,936 to Hitomi, et al. ("Hitomi, et al.")

Hitomi, et al. discloses:

- air pre-compression with cooling (Fig. 3 and col. 6, lines 44-49 (supercharger 32, intercooler 33));
- the intake valve is open during a majority portion of the compression stroke and closed in the second half of the compression stroke (Fig. 6 and col. 9, lines 24-29 (up to 100° after bottom dead center (ABDC))); and
- EGR (exhaust gas recirculation) mixes recirculated exhaust gas and intake air upstream of supercharger 32 (Fig. 3 (EGR passage 65, cooler 72)).

U.S. Patent No. 2,817,322 to Miller ("Miller '322")

Miller '322 discloses:

- direct injection diesel engine (col. 1, lines 27-29, col. 2, lines 1-6, and Fig. 3 (injector 40));
- air pre-compression with cooling (Fig. 3 (compressor 24, intercooler 26)); and

- the intake valve may be closed late in the compression stroke (col. 5, lines 26-37).

Copies of the listed foreign and non-patent literature documents are attached.

The attached documents include a copy of the English language translation referred to above. Applicants respectfully request that the Examiner consider the listed documents and indicate that they were considered by making appropriate notations on the attached form.

This Information Disclosure Statement is being filed after the events recited in Section 1.97(c) but, to the undersigned's knowledge, before the mailing date of either a Final action, Quayle action, or a Notice of Allowance. Under the provisions of 37 C.F.R. § 1.97(c), this Information Disclosure Statement is accompanied by a fee of \$180.00 as specified by Section 1.17(p).

This submission does not represent that a search has been made or that no better art exists and does not constitute an admission that each or all of the listed documents are material or constitute "prior art." If the Examiner applies any of the documents as prior art against any claim of this application, and Applicants determine that the cited documents do not constitute "prior art" under United States law, the Applicants reserve the right to present to the Office the relevant facts and law regarding the appropriate status of such documents.

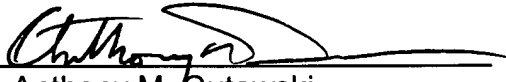
Applicants further reserve the right to take appropriate action to establish the patentability of the disclosed invention over the listed documents, should one or more of the documents be applied against the claims of the present application.

If there is any fee due in connection with the filing of this Statement, please
charge the fee to our Deposit Account No. 06-0916.

Respectfully submitted,

FINNEGAN, HENDERSON, FARABOW,
GARRETT & DUNNER, L.L.P.

Dated: March 22, 2006

By: 
Anthony M. Gutowski
Reg. No. 38,742

MAR 22 2006

Complete if Known

INFORMATION DISCLOSURE STATEMENT BY APPLICANT

(Use as many sheets as necessary)

Sheet

1

of

2

Application No.

10/733,570

Filing Date

December 12, 2003

First Named Inventor

WEBER et al.

Art Unit

3747

Examiner Name

Mahmoud Gimie

Attorney Docket Number

08350.1649-02

U.S. PATENTS AND PUBLISHED U.S. PATENT APPLICATIONS

Examiner Initials	Cite No. ¹	Document Number Number-Kind Code ² (if known)	Issue or Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear
		US-2,344,993	03/28/1944	Lysholm	Figs. 4, 8, and 9; p. 4, col. 1, Ins. 31-40; p. 4, col. 2, Ins. 32-37; p. 4, col. 2, Ins. 62-71.
		US-2,670,595	03/02/1954	Miller	Figs. 1 and 6; col. 2, Ins. 13-15; col. 6, Ins. 67-70; col. 8, Ins. 14-23; col. 9, Ins. 8-22.
		US-2,817,322	12/24/1957	Miller	Fig. 3; col. 1, Ins. 27-29; col. 2, Ins. 1-6; col. 5, Ins. 26-37.
		US-3,015,934	01/09/1962	Miller	Figs. 1, 4, and 5; col. 1, Ins. 48-60; col. 2, Ins. 31-35.
		US-3,257,797	06/28/1966	Lieberherr	Figs. 1, 4, and 7; col. 6, Ins. 57-63; col. 10, Ins. 17-24; col. 14, Ins. 13-15 and 23-24; col. 3, Ins. 1-9; col. 9, Ins. 48-49 and 53-71; col. 13, In. 66 to col. 14, In. 5.
		US-4,798,184	01/17/1989	Palko	Fig. 2; col. 2, Ins. 47-48; col. 3, Ins. 3-15 and 43-51; col. 5, In. 67 to col. 6, In. 10; col. 6, Ins. 45-50.
		US-4,805,571	02/21/1989	Humphrey	Col. 2, Ins. 54-56; col. 6, In. 50; col. 14, Ins. 50-52; col. 21, Ins. 5-8; col. 24, Ins. 30-40.
		US-4,878,464	11/07/1989	Richeson, Jr. et al.	Fig. 12a; col. 11, In. 26 to col. 12, In. 7.
		US-4,930,315	06/05/1990	Kanesaka	Figs. 7 and 16; col. 6, Ins. 37-43; col. 9, In. 63 to col. 10, In. 9.
		US-5,357,936	10/25/1994	Hitomi et al.	Figs. 3 and 6; col. 6, Ins. 44-49; col. 9, Ins. 24-29.
		US-5,429,100	07/04/1995	Goto et al.	Figs. 1, 3, 4, 5, and 10; col. 2, Ins. 15-18; col. 3, In. 61 to col. 4, In. 11; col. 4, Ins. 23-27.
		US-5,549,095	08/27/1996	Goto et al.	Fig. 1; col. 1, Ins. 15-18; col. 4, Ins. 42-44; col. 5, Ins. 24-27.
		US-5,617,726	04/08/1997	Sheridan	Fig. 7; col. 5, Ins. 12-15.

IDS Form PTO/SB/08: Substitute for form 1449A/PTO				Complete if Known	
INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Use as many sheets as necessary)				Application No.	10/733,570
				Filing Date	December 12, 2003
				First Named Inventor	WEBER et al.
				Art Unit	3747
				Examiner Name	Mahmoud Gimie
Sheet	2	of	2	Attorney Docket Number	08350.1649-02

FOREIGN PATENT DOCUMENTS						
Examiner Initials	Cite No. ¹	Foreign Patent Document	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear	Translation ⁶
		Country Code ³ Number ⁴ Kind Code ⁵ (if known)				
		JP-07-091265	04/04/1995	Matsuyoshi et al.	Figs. 1, 14, and 21	Yes

NON PATENT LITERATURE DOCUMENTS				
Examiner Initials ⁷	Cite No. ¹	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc.), date, page(s), volume-issue number(s), publisher, city and/or country where published.	Translation ⁶	
		Zappa et al., CIMAC, "A 4-Stroke High Speed Diesel Engine with Two-Stage of Supercharging and Variable Compression Ratio," 13 th International Congress on Combustion Engines, Vienna, 1979 (23 pages).		
		Obert, "Internal Combustion Engines, 2 nd Edition, <i>Analysis and Practice</i> " (pp. 142-144, 153 and 154; Fig. 5-12) (1950).		
		Thring, R., "The Flexible Diesel Engine," SAE Technical Paper Series 900175, Feb. 26 - Mar. 2, 1990 (p. 31, col. 1, 1 st para.; col. 1, 2 nd para., Ins. 1-4; p. 31, col. 2, 2 nd para., Ins. 9-11; col. 2, last para., Ins. 1-2; p. 31, col. 2, Table 1; p. 36, col. 1, first full paragraph; col. 2, last paragraph, Ins. 1-2) (pp. 31-39).		
		Further Translation of JP 07-091265, listed above (pp. 9-10, para. 15; pp. 11-12, para. 20; p. 13, para. 24) (30 pages).		
		Request for <i>Ex Parte</i> Reexamination Transmittal Form filed January 20, 2006 (Control No. 90/007,885); Request for <i>Ex Parte</i> Reexamination filed January 20, 2006; Claim Chart entitled: Comparison of '280 Patent Claims to Zappa et al.; executed Declaration of Dr. Joel Hiltner; Exhibits A-E; copy of U.S. Patent No. 6,688,280; Form PTO SB/08 listing 3 documents cited in the Request and copies thereof; Order Granting/Denying Request for Ex Parte Reexamination for Control No. 90/007,885.		

Examiner Signature		Date Considered	
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EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant.